

Claims

1. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) and injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42).

2. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,

- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₁) demolding of the housing part (10, 13, 53) at very high temperatures and maintenance of this temperature to reduce stresses and permit secondary crystallization processes to occur.

3. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₂) demolding of the housing part (10, 13, 53) from the first cavity and execution of an intermediate treatment of the resulting premolded part (41) to selectively reduce stresses in the premolded part (41).

4. The method according to claim 3, characterized in that a thermal intermediate treatment of the premolded part (41) serves as the intermediate treatment.

5. The method according to claim 3, characterized in that oscillations are introduced or radiated into the premolded part (41) as the intermediate treatment.
6. The method according to claim 1, 2, or 3, characterized in that a partially crystalline thermoplastic with a high melting temperature is used as the first plastic material.
7. The method according to claim 1, 2, or 3, characterized in that an amorphous high-temperature thermoplastic with a very high glass temperature is used as the first plastic material.
8. The method according to claim 1, 2, or 3, characterized in that the second plastic material (57) of the valve flap part (17, 18, 23) is a partially crystalline thermoplastic with a melting temperature lower than that of the plastic material used for the injection molding of the premolded part (41).
9. The method according to claim 1, 2, or 3, characterized in that the second plastic material (57) of the valve flap part (17, 18, 23) is an amorphous high-temperature thermoplastic with a melting temperature lower than that of the plastic material used for the injection molding of the premolded part (41).
10. The method according to claim 1, 2, or 3, characterized in that the second plastic material (57) of the valve flap part (17, 18, 23) is a partially crystalline thermoplastic with a melting temperature higher than that of the plastic material used for the injection molding of the premolded part (41).

11. The method according to claim 1, 2, or 3, characterized in that the second plastic material (57) of the valve flap part (17, 18, 23) is an amorphous high-temperature thermoplastic with a melting temperature higher than that of the plastic material used for the injection molding of the premolded part (41).

12. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₃) demolding of the valve flap part (17, 18, 23) obtained according to process step c) inside the premolded part (41) in a position of the valve flap part (17, 18, 23) inside the premolded part (41) that produces an extremely narrow gap geometry or in a sealed position of the valve flap part (17, 18, 23) inside the premolded part (41), which position is defined during the injection of the second plastic material for the valve flap part (17, 18, 23).

13. The method according to claim 12, characterized in that the valve flap part (17, 18, 23) is injection molded inside the premolded part (41), in a position that permits it to pass through the gas passage (13).

14. The method according to claim 12, characterized in that the valve flap part (17, 18, 23) is injection molded out of the second plastic material (57) in an inclined position that prevents the valve flap part (17, 18, 23) from passing through the cross section of the gas passage (13).

15. The method according to claim 2, 3, or 12, characterized in that gaps (61, 62) between the valve flap part (17, 18, 23) and a gas passage (13) of the housing part (10) and at the bearing points of the valve flap part (17, 18, 23) are selectively adjusted according to process steps d_1), d_2), d_3) and by taking into account the expansion and/or contraction or secondary crystallization and by taking into account the rheological behavior of the plastic materials used, such as flow properties, molecular chain orientation, and possible recoveries.

16. The method according to claim 3, characterized in that the intermediate treatment of the premolded part (41) according to process step d_2) occurs at a temperature higher than the glass temperature of the first plastic material.

17. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₄) application of a third material after process step a) onto molding surfaces (63, 64) for the second plastic material (57) of the valve flap part (17, 18, 23) to be subsequently injection molded in the premolded part (41).

18. The method according to claim 17, characterized in that the third material is rubbed into the molding surfaces (63, 64) of the premolded part (41) in the form of a lubricant.

19. The method according to claim 17, characterized in that the third material is applied in sheet form as a spacer layer to the molding surfaces (63, 64) of the premolded part (41).

20. The method according to claim 17, 18, 19, characterized in that in subsequent process steps, a thermal treatment is used to partially or completely remove the third material from a two-component injection molded part (60) thus obtained.

21. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₅) insertion of bushes (70, 71) into openings (14) of the premolded part (41) so that they are rotationally fixed in relation to the premolded part (41), before or during the transfer of the premolded part (41) to the second cavity (42).

22. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,

- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₆) insertion of bushes (70, 71) and reverse injection with rotational fixing in relation to the flap shaft parts (19, 20) of the valve flap part (17, 18, 23) before or during the transfer of the premolded part (41) to the second cavity (42).

23. The method according to claims 21 or 22, characterized in that the bushes (70, 71) are made of a metallic or nonmetallic material with a low coefficient of friction in comparison to the first plastic material or the second plastic material (57).

24. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity, and

- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), in which the injection points (15, 24) for introducing plastic materials for the housing part (10, 13, 53) and the valve flap part (17, 12, 23) are positioned in the cavities in such a way that the flow orientation of chain molecules of the plastic materials and their reinforcing and filler materials are used to influence the shrinkage behavior of the housing part (10, 13, 53) and the valve flap part (17, 18, 23) during the cooling phase so that the second plastic material (57) of the valve flap part (17, 18, 23) shrinks away from the housing part (10, 13, 53) in the intended manner in order to adjust the gaps (61, 62).

25. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and

- d₇) introduction of a third material into the gap geometries (61, 62) of the two-component injection molded part (60) where the gap geometries (61, 62) lie outside the tightness specification before the introduction of the third material and then – after the possibly partial removal of the third material – lie within the tightness specification.

26. A method for manufacturing a throttle valve unit having a housing part (10, 13, 53) and a valve flap part (17, 18, 23) that is able to move in relation to it, including the following process steps:

- a) injection molding of the housing part (10, 13, 53) out of a first plastic material in a first cavity,
- b) transfer of the premolded part (41) of the housing part (10, 13, 53) obtained according to process step a) to a second cavity (42) spatially separate from the first cavity,
- c) injection molding of the movable valve flap part (17, 18, 23) out of a second plastic material (57) inside the premolded part (41) of the housing part (10, 13, 53) in the second cavity (42), and
- d₈) introduction of a fourth material into the gap geometries (61, 62) of the two-component injection molded part (60) with bushes (70, 71), where the gap geometries (61, 62) lie outside the tightness specification before the introduction of the fourth material and then – after the possibly partial removal of the fourth material – lie within the tightness specification.